The Journal of American Arboriculture

Trees...

Original Upright Norway Maple as Discovered by B. H. Slavin, Rochester, N. Y. (Story Page 9)

METHODS OF TREE INJECTION — *Curtis May*

MAPLE AND BIRCH IN UPRIGHT GROUP — *M. Milne and J. Gerling*

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TREES Magazine is a bi-monthly Journal published at Santa Monica, California, by Edward H. Scanlon, and is devoted to the furtherance of the technical and business administration of Trees (Street and Ornamental); Parks (Municipal and National); and Forests (State, National and Private), in the U. S. P. O. Box 886, Santa Monica, California. Subscription by mail, $1 per year; outside United States, $1.50. Advertising rates upon inquiry. Unsolicited manuscripts must be accompanied by postage return.

ALONG THE WAY

With . . .
EDW. SCANLON

■ A FINE THING for the CITY OF SAN DIEGO would be to plant the FIVE MILE CURVING SHORELINE road of MISSION BAY with PHOENIX CANARIENSIS PALMS, 100 FEET APART. WHAT AN APPROACH they would have!

* * *

■ *THE TOWSON NURSERIES (from the Md. city of the same name) in their quarterly "THE FOUR SEASONS" have a fine article SUGGESTING the planting of TREES THAT BLOOM IN THE SUMMER. Why be drab?*

* * *

■ A bulletin that every arborist in the Illinois area should have has been published by the Division of the NATURAL HISTORY SURVEY, URBANA, ILL. Vol. 21, Articles 6 and 7—No. 6 is entitled PRELIMINARY INVESTIGATION OF OAK DISEASES IN ILLINOIS by J. CEDRIC CARTER. It's a fine thing.

■ *HAROLD NEWINS has been very kind inviting me to the SOUTHERN SHADE TREE CONFERENCE at MIAMI, FLORIDA this coming FEBRUARY. I'd sure like to go; HAVEN'T FELT ANY COLD WEATHER for MANY YEARS now . . . WOULD BE A NOVELTY! (Top that!)*

* * *

■ WILBUR SAVAGE of the NATIONAL PARK SERVICE, FT. OGLETHORPE, Ga., sent me a nice quantity of BIG-LEAF MAGNOLIA seed—also a carefully packed leaf. The LEAF HAS BEEN FRAMED and measures 24 INCHES LONG by 11 INCHES WIDE. SOME PICTURE!

* * *

■ *The Marine Corps has taken an ARBORIST into its fold. JOHN O'LEARY OF WEST CLAREMONT, N. H., changes his address and says he's there "FOR THE DURATION." Let's hope THAT'S SHORT.*

A Merry Christmas
and
A Happy New Year

■ We do get an OCCASIONAL PAT ON THE BACK and here's one from DICK WHITE, Exe-Secy of the AMERICAN ASS'N. OF NURSERYMEN, that rings the bell—"Very seldom do I feel the urge to congratulate editors on their editorial brain children. However, I must do so in regard to your editorial in the Sept.-Oct. issue of TREES entitled 'Street Trees Good Business.' This editorial hits the nail on the head and if more city arborists would put their budget request on a business basis as you suggest, they would be removed from the position of charitable institutions, picking up the crumbs, as they are in many cities."

* * *

■ *Our "hot dog man" in the last issue brought a FACETIOUS P. S. from E. L. D. SEYMOUR, horticultural editor of THE AMERICAN HOME (another good magazine) as follows: "I have just looked through your interesting Sept.-Oct. issue. I hope, though, you are not encouraging the use of roadside signs—even where advertising is advisable (see inside cover). I assume (and hope) that your hypothetical hot dog man was in—and limited his signs to—a purely COMMERCIAL zone!"*

* * *

■ Thanks to F. J. PIPAL, CITY FORESTER OF OMAHA, for a copy of his STREET TREE ORDINANCE. BILL ERDMAN was kind enough to send one also for the SAME CITY so I am sending the extra to BOB THOMPSON, who seems to be HAVING DIFFICULTIES.

* * *

■ WINGS OVER BOSTON! We're going to have an ACE in our midst. MIKE HARTNEY has his PRIVATE LICENSE TO PILOT a plane; he'll probably MOUNT A MACHINE GUN and SPRAY JAP-BEETLES. NICE GUY!

■ You've heard this before, but the other day at the LOS ANGELES Union Station, I saw a sweet little old lady, JUST OFF A TRAIN from the East, CAREFULLY cuddling a TINY GERANIUM PLANT. Won't she be terribly SURPRISED when she sees TEN-FOOT HEDGES of her favorite!

* * *

■ *Why is it people are so COURTEOUS IN ELEVATORS and such DROOPS IN AUTOMOBILES?*

* * *

■ *Heard a song the other day that MIGHT BE PROPHETIC—"Cheer Up; Everything's Going to Be Lousy!"*

* * *

■ *The ARMY got LAWRENCE DOHRMAN of FLUSHING, N. Y. Hey! WHAT IS THIS?*

Contents

Vol. 4 BI-MONTHLY No. 6

The Editors of TREES invite discussions, comments and all types of literary materials pertaining to trees and tree preservation from any person engaged either in the scientific advancement or commercial development of the field.

Editorial 4
Tree Preservation on the March
Fastigiate Tree Series Completed
The Man in the Field Reports . . 6
Odditrees 6
Methods of Tree Injection . . . 7
Curtis May
City Arborists' Column 8
The National Arborists Association Begins To Function 8
Norway Maple and Birch in Upright Group 9
M. A. Milne and J. Gerling
Thru the Microscope 17
C. J. Humphrey
Book Reviews 18

■ *WOODPECKERS are GOING TO TOWN on CHINESE ELM around WAUWATOSA, WIS., according to HOWARD MUELLNER, CITY FORESTER. Nurserymen have started to GIVE THEM AWAY. (They must be bad).*

* * *

■ FRANK KNIGHTON, V.P. of PROTEX INDUSTRIES, INC., says he has engaged a SALES MANAGER, MR. W. LEE BATES, who was with Stumpp & Walter Co. for many years. WHOM SHALL WE CONGRATULATE, FRANK?

* * *

■ Had a very PLEASANT SURPRISE just after Turkey-day, TOM LEASE, PARK SUPT. OF GREAT FALLS, MONTANA, dropped in. Showed us SOME SWELL MOVIES of his burg.

* * *

■ *The "ROSE" OF HINSDALE is WORKING HARD on the plans for the NEXT SHADE TREE CONFERENCE in CHI. He promises SOME SURPRISES. COME ON, tell us, ROSEY.*

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November-December, 1941 *The Journal of American Arboriculture* Volume 4 — No. 6

EDWARD H. SCANLON, Editor
Editorial Office: Santa Monica, California

"No place is complete without trees. A home without trees is charmless; a road without trees is shadeless; a park without trees is purposeless; *a country without trees is hopeless*"

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CORDIALLY YOURS

TREE PRESERVATION ON THE MARCH

Now it appears that by the time the chairman swings his gavel to call the Eighteenth National Shade Tree Conference to order in Chicago next August, twe new well-developed roots will have been in-arched to the parent stem.

The Western and Southern Shade Tree Conferences at their annual meetings, the Southern at Miami, Florida, in February, and the Western at Long Beach, California, in May, will officially vote affiliation as chapters of the National Conference. This is a splendid tribute to the progressiveness of the leaders of American Arboriculture; foreshadowing as it does a cohesion within the profession throughout the country that will lead to an organization financially well-equipped to adequately disseminate an understanding of accepted tree preservation methods that will raise the standard of the members, increase the need for *skilled* services and gradually eliminate the parasites.

It is the solemn obligation of every man and organization engaged in tree preservation work to become a member of this, now truly, National Shade Tree Conference. An arborist who shuns membership will in time seriously regret his failure to cooperate with his fellows in building this infant profession to one of respect and affluence. Membership will become a badge of merit, achievement and integrity, and with this new, united front will be so recognized by the public. When this time comes, and it lies in the very near future, the men who fail to get in and pitch *now* may regret their selfishness and lack of vision.

FASTIGATE TREE SERIES COMPLETED

The splendid series of articles describing twelve various varieties of upright or fastigiate trees that we have been pleased to present to the readers of Trees throughout this past year is completed in this issue.

Malcom A. Milne, City Forester and J. Gerling, Assistant Superintendent of Parks at Rochester, N. Y., have made a splendid contribution to the awakening field of Municipal Arboriculture in presenting to the planners of city street trees the untold potentialities of this very useful and badly needed form of tree.

For the narrow city street, of which there are so many and which will be a problem for many years to come, this tree variety offers the answer to aesthetic in-scale embellishment. The group of trees described by the authors offer flowering trees, fall color, long life, fine and coarse textured foliage and what is of tremendous importance all of the varieties are the answer to the most stupid mistake made by so-called city planners and subdivision developers—narrow parkways or planting strips.

R. S. LEMMON JOINS AMERICAN HOME STAFF

"As of September 29th, we have added to our staff as Associate Horticultural Editor and Assistant to E. L. D. Seymour, Horticultural Editor since December, 1936, Mr. Robert S. Lemmon of New Canaan, Connecticut, who needs little introduction to those familiar with modern horticultural progress.

Mr. Lemmon has been from early youth a lover and student of nature, plants, birds, etc. At one time he was associated with the American Museum of Natural History. Later, for 14 years, he was Managing Editor of House & Garden, during which time he also became well known to its readers as that lovable philosophical contributor, "Old Doc Lemmon." After leaving House & Garden, he launched, as Editor and Publisher, the magazine Real Gardening, of digest size, a thoroughly practical journal, which he continued for several years and then merged last Spring with the Gardener's Chronicle."

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PROGRESSIVE STEP FOR CENTRAL STATES PARKS

The CENTRAL STATES PARK ASSOCIATION was organized at Davenport, Iowa, on November 6th. W. H. Romine, Park Superintendent of Davenport, was elected President; Mr. Birks, Superintendent of Parks, Moline, Ill., as Secretary-treasurer. The next meeting was set for Des Moines, Iowa, December 12th, 1941 at 10:00 A.M. A tour of the Davenport park system and a dinner at the Chamber of Commerce Building filled out the program. Seven midwest cities were represented and an attempt is being made to double this at the next meeting.

—R. K. Alman, Cedar Rapids, Iowa

Huge Elm Moved

GLOUCESTER, Mass.—A 52-foot elm tree weighing 35 tons was trucked 32 miles from East Gloucester to West Newbury at a cost of $400 to fill a vacant space in the landscape of Mrs. William Dickie's estate.

May Meeting Long Beach For Western Arborists

Under the relentless driving of President Ted Holderness, the Executive Committee of the Western Shade Tree Conference has been holding monthly meetings ever since the San Jose Convention for the purpose of drafting a top-notch program.

In rough form, as it now stands, it will be just that. Ted is concentrating on a very spectacular field demonstration with cabling, boxing and other practical phases of tree preservation as the theme.

The meeting, the ninth in the Western Shade Tree Conference history, will be held at Long Beach, May 7, 8, 9, 1942. Herman Scherer, Supt. of Parks at Long Beach, is Chairman of Local Arrangements.

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The Man In the Field Reports

INDIRECT ADVERTISING

By F. C. THOMAS
Arborist
Greensboro, N. C.

Since it is vitally essential to the arborists success that he have the confidence of the public and be widely known, it behooves him to leave no stone unturned to keep his name before the public, in order that the prospect will think of him, rather than some one else when in need of the services of a tree preservationist. The writer has utilized various forms of advertising ranging all the way from danger signs to shirt lettering and newspaper writing and it is about the latter form that I would like to say a few words.

Some four years ago, I was thinking one day of how uninformed the public as a whole is relative to the necessity of follow up work that is so essential a year or two after a sleet storm or other agency makes it necessary to do a large amount of heavy cutting, namely repainting the partly healed pruning wounds etc., and I decided to submit an article on the subject to the local daily paper as follows:

Repainting Old Wounds
By F. C. THOMAS

During the summer months, when the trees in the yard are wearing their cloak of leafy green which screens much of their interior from the casual observer, the home owner as a rule has a tendency to feel that his trees are in good condition. Especially if he has had them pruned or otherwise treated within the past few years and there are few, if any dead or diseased branches visible from the ground.

On the other hand, during that period of the year when the trees are leafless, their actual condition is much more noticeable. Particularly is this true of the tri-city area of Greensboro, High Point and Winston-Salem, where they suffered such frightful damage during the sleet storm of 1934.

It does not take an expert to tell that a large number of our trees present a sad

(*Continued on page* 13)

ODDITREES

Some time ago TREES received the two interesting photos reproduced here from Jake Gerling, Asst. Supt. of Parks at Rochester, N. Y. While not strictly speaking an 'Odditree' still the rough-barked Yellow-wood is very out of the ordinary; however, let's listen to Jake tell the story:

"Maybe you can, by way of "TREES" shed some light on this Yellow-wood.

Rough bark Yellow-wood

This specimen was located in a private yard by Barney Slavin, Supt. of Parks, and has been shown to many tree men the past few years. They look, admit that something is amiss, promise to 'look it up' and we hear no more about it. As the photo shows, the bark is very rough—more like a Black Oak than anything I can think of right now—and a real dark gray, almost black. I am also sending a shot of the specie type (native Cladrastis lutea) (right) whjch shows the characteristic smooth, light gray bark. I have seen many of these trees, but never one like this one in question. My thought in sending the poser to you is that perhaps one of your readers may be familiar with the genus and able to help us identify the specimen. Neither I nor our herbarium staff can find any marked difference in the essential organs, and our limited knowledge of this genus has us stymied.

Smooth bark of the specie Yellow-wood

We would very much like to know if it is another specie or merely a sport with unusual bark formation. The tree is quite old, though not any larger than many having smooth bark, and it may be that they roughen with advanced age even though we have many well-matured trees still in smooth bark. This plant has us guessing and we will sure appreciate any info in the matter."

There you are; can anyone throw any light on this interesting "Odditree"?

Methods of Tree Injection

By Curtis May
Forest Pathology Field Laboratory
Bureau of Plant Industry
U. S. Department of Agriculture
Morristown, N. J.

Forward looking arborists have long been intrigued by the possibility of treating trees internally for various abnormal conditions. But the lack of authentic treatments and the all too prevalent exploitation of the field by quacks made conservative operators wary of all injection methods. However, recently there has been an increased interest by reputable organizations in direct internal treatments of shade trees. The stimulation has come from diverse sources. Realization of the inadequacy of present externally applied remedies, successes attained in the use of specific drugs for specific diseases in man, and the development of many new organic compounds, some of which may be valuable therapeutic agents for tree diseases, have all contributed their share. Then, too, more accurate knowledge of how and where compounds are distributed in trees by the natural movements of solutions has fostered the hope that a suitable technique could be devised for effectively introducing beneficial chemicals and insuring their distribution to the desired tissues of the tree.

Direct introduction of substances into trees has been tried for many purposes, including (1) tracing the course of the transpiration stream and the distribution of various substances, (2) stimulation of growth, flowering, or fruiting, (3) the diagnosis and correction of various mineral deficiencies, (4) prevention and cure of fungous diseases and control of insect pests, (5) investigation of internal diseases, (6) coloring foliage for ornamental effects, (7) imparting special odors or flavors to fruits and flowers, (8) killing unwanted trees, (9) preservation of the wood from decay after felling, and (10) coloring wood for ornamental effects. Here we are concerned only with those methods of injection commonly used for the first six purposes.

In this discussion the term "injection" is considered in the broad sense to include all methods of introducing chemicals into the tissues of the tree.

Recent Advances in Soil Treatments

The easiest way to provide a tree with substances dissolved in water would seem to be to place the substance on or in the soil around the roots where it could be absorbed by natural processes. Fertilizers are commonly applied this way. But even with fertilizers, which are comparatively cheap, a considerable part of the potentially useful components applied to the soil are not absorbed by the trees. Moreover, some chemicals that can be dissolved in water go out of solution when mixed in the soil and can not be absorbed by plant roots. However, in the much publicized practice of hydroponics, in which plants are grown in sand or water cultures where the components of the nutrient solution can be controlled, adding therapeutic or prophylactic chemicals to the nutrient solution seems to have worthwhile possibilities. For example, selenium added to the nutrient solution has been used successfully to control aphids and red spiders on corn (14) and red spiders on elm (19). Perhaps eventually applications of compounds to the soil will be the most practical method of supplying chemicals to plants, but for the present, direct injection of materials into the plant seems the best experimental approach to the problem of finding out what to inject for specific troubles.

Fig. 3. A. Method of Lantz (1938). Rubberized fabric or waterproof crepe paper bag sealed around the trunk with asphalt. Top, in the case illustrated, gathered and protected but not sealed to prevent dilution of solution by rain. B. Pan method of Shevyrev (1895). Cuts are made with the chisel. Plastic clay closes the seal between the trunk and pan. C-clamps hold the seam in place. Seam is covered with adhesive tape to make a watertight joint. It is usually necessary to smooth rough bark to obtain a tight seal but a rubber collar helps in this respect.

Dry Injections

The first record of the injection of dry substances comes to us in a French translation by Clement-Mullet (5, vol. 1, chap. 15, p. 597) of a manuscript by the Moor, Ebn El Awam. Ebn El Awam recorded that in 1158 Hadje de Granada attempted to impart flavors and odors, and purgative and medicinal qualities to flowers and fruits by placing various substances in the "pith" of roots or shoots. The pith was removed and the various substances inserted in its place. Later, in 1602 an anonymous writer (1) advised inserting spices or "whatsoever you will" into the heart of a tree, then tying the bark carefully back into position. In the next step he "anointed with lome and oxedung, and the fruit will get both the savour and colour, according to the spice you have put in it." This unknown pioneer with a curious mind also mentions that if one "take pepper, laurell, and incense, and mingle all together with good wine" and inject it into a tree the worms will die.

Inserting dry, stick, or powdered sulphur in holes bored into tree trunks was advocated long ago but results were unsatisfactory according to Watson (21). Substances so insoluble as sulphur remain where they are placed in the bore hole. However, if a deliquescent substance or one that goes into solution readily upon contact with water is placed in some trees, the material may go into solution and move or be carried to various parts of the plant. In this way sodium arsenite pellets placed in holes bored into the trunks of elms were effec-

(*Continued on page* 10)

National Arborists Association Begins to Function

By EDWARD H. SCANLON

Several years ago the growing field of Tree Preservation began to feel the need of coordinated representation in matters pertaining to the legal and business phases of its structure. The result was the formation of the National Arborists Association in 1937 at the Baltimore meeting of the National Shade Tree Conference.

KARL AMALIA
President

Hartney & Amalia Co., Boston, Mass.

The growth of this professional business in the past ten years, despite the depression, is a tribute to its solidarity and to the determination of a sturdy phalanx of pioneers to inject dignity as well as stability in this rising enterprise.

At Baltimore, H. M. Van Wormer of Richmond, Virginia, was elected the first president and at St. Louis the following year a constitution was adopted. This paper established that "the Association . . . is to bring together those persons or firms engaged in the care of trees as a livelihood by the recognized methods of tree surgery, pruning, spraying, fertilizing, diagnosis, and kindred activities, in order that the profession may be recognized as a science and its activities may be promoted, that problems pertaining to practices may be discussed by the group as a whole or by committees, and to cooperate in securing or opposing legislation pertaining to the care of trees or those engaged in this work."

Without a permanent Secretary it was found that many important legislative matters in the various states and Washington were not being given the study and consideration they merited in their relation to the profession. Acting promptly and determinedly the Association at an eventful meeting in Washington, D. C., voted to employ a secretary. Dr. Paul E. Tilford, plant pathologist at the Ohio Agricultural Experiment State, Wooster, Ohio, and Editor of The "Arborists News," monthly publication of the National Shade Tree Conference, was then approached on the matter and accepted the post.

Dr. Tilford has long been active in the affairs of the National Shade Tree Conference and to date has been active in securing a favorable interpretation of the Federal Wages and Hours law for tree men. Also, the organization has aided in passing laws in some states regulating the activities of arborists. It is understood that state Certified Arborists laws will be one of the N.A.A.'s main objectives.

The officers for the current year are: President, Karl Amalia, Manchester, Mass.; First Vice-President, W. S. Speed, Columbus, Ohio; Second Vice-President, O. F. Warner, Waterbury, Conn.; Secretary-Treasurer, Paul E. Tilford, Wooster, Ohio; Directors, J. Cooke White, Arlington, Mass., C. D. Wolf, Detroit, Mich., W. E. Parker, Moorestown, N. J.

DR. PAUL TILFORD
Secretary

Ohio Agricultural Experiment Station, Wooster, Ohio

A total of fifty tree preservation companies comprise the present roster of the Association, and a very intense drive was launched early this fall to double this number before the Chicago meeting next August.

Trees and Camouflage

PONCE, Puerto Rico.—Uncle Sam's engineers engaged in converting Puerto Rico into the key military base in the Caribbean are getting a break from Nature. Puerto Rico's main highways are lined with flamboyant trees which form perfect arches over the highways, making them invisible from the air. Thus camouflage is unnecessary.

THE *City Arborists'* COLUMN

What Is a Tree Worth?

The heading seems like a very futile question and well it may be. Some people are overjoyed if a fine street tree in front of their home dies, others make every effort to "subtley" destroy them, while another class of thinkers prize their trees beyond financial computation.

It would seem that an academic solution to the heading would be the ability or possibility of striking a happy medium between the two extremes and of evaluating the value of a tree by weighing the various factors pertaining to its location and specie.

Recently we received an inquiry from Mr. R. Kent Beattie, principal pathologist, Bureau of Plant Industry, U.S.D.A., Washington, D. C. Mr. Beattie is interested in securing figures as to the number and value of shade trees in this country. He notes that arborists, whom he has consulted in regard to removing the 5,000 or more large elms killed in Columbus, Ohio, by the phloem necrosis, estimated that the cost would average $30.00 per tree. Approximately the same figure was estimated for the removal of 10,000 planes killed by the plane tree disease in Philadelphia several years ago.

This means of evaluation places a definite value on the tree however, and all will agree, not a fair one. Mr. Beattie would like to hear from cities where a survey and perhaps a valuation has been placed on shade trees. This column believes that here is an opportunity for varied expressions. We hope that all city arborists and park superintendents will contact Mr. Beattie and also send in their opinions on this matter.

* * *

Frank Karpick, Asst. City Forester of Buffalo, N. Y., writes that he very heartily is in favor of the steps taken to hold a special meeting of municipal arborists at the National Shade Tree Conference.

(*Continued on page* 16)

Maple and Birch In Upright Group

By M. A. Milne & J Gerling

UPRIGHT NORWAY MAPLE

(*Acer platanoides ascendens syn, erectum*)

For detailed discussion see "Trees" magazine; October, 1939; p. 14. The following additional facts may be pertinent to our discussion of this variety.

Lateral branches are short, very slow-growing, and nearly perpendicular to the trunk at the axils, sweeping upward at the ends. With most trees, a few of the laterals will grow more rapidly than the others. For this reason it is necessary to prune these back periodically in order to develop the narrow, pyramidal shape and prevent multiple leaders at the top of the trees. The lower branches of this tree may be trimmed off without seriously detracting from its appearance, making it particularly valuable for planting on streets having narrow parking spaces.

Upright Norway Maple is attacked by the Norway maple aphid. However, these attacks do not result in the heavy midsummer leaf fall which often results from attacks by this insect on the parent species. The reason there is no leaf-fall from the variety is believed to be due to the fact that nearly all the leaves are exposed to full sunlight. Leaf-fall from the species is almost entirely from the interior of the crown where leaf attachment has become weakened through shading.

This tree has the darkest colored leaves of any maple, which gives an added charm to the dignity of its shape.

The original Upright Norway Maple from which the many hundreds now present in the Rochester park and street tree systems were propagated, stands in Mount Hope Cemetery. It is about 40 years old, 10 inches in diameter at a point 3½ feet above the ground, and 30 feet high (see cover picture). The tree is retaining its shape through the years, which promises well for those propagated from it.

A very narrow street planted to Upright Norway maples. What other tree would fit so well this extreme situation.

PYRAMIDAL WHITE BIRCH

(*Betula alba fastigiata*)

European White Birch (Betula alba) and the variety Weeping White Birch (Betula alba pendula) have long been favorite trees for specimen planting and to a limited extent for street embellishment. The distinct paper thin, chalk-white outer bark and delicate tracery of the slender twigs give the white birch a year around value for landscape adornment.

The species and pendulous variety are rapidly losing their place of prominence due to the deadly attacks of the Bronze Birch Borer (Agrilus anxius). This insect lays its eggs beneath the bark and the grubs mine out the cambium, working around the branches to form perfect girdling circles. A raised portion in the bark may be observed where the insect has been feeding. The tree is generally attacked at the top first and later the larger branches and trunk may be infested causing the death of the tree. It is now practically impossible to raise a tree to maturity.

There is a variety, Pyramidal White Birch (Betula alba fastigiata), which may prove resistant to the attacks of the borer. The open crown of the species seems to invite attacks, whereas the compact crown of the fastigiate variety may be expected to discourage attack by the borer. Also, the fact that attack occurs at the top first, seems to indicate the insect prefers open branches exposed to the sun. No larger branches are so exposed in the upright variety.

The branches of this variety are strictly fastigiate, closely hugging the trunk. They divide and sub-divide into slender twigs which wave with the slightest breeze. The leaves are small, triangular, dark green and glossy above, paler beneath. The tree retains its leaves until late autumn.

Propagation is by cuttings. Growth is fairly rapid. The trees should be kept root pruned in the nursery and transplanted with a ball of earth.

This tree should be planted in moist, well-drained, fairly rich soil. It requires full sunlight.

Maintenance cost is very low. A little pruning may be necessary, particularly at the top, in order to shape the trees. Branching from a point close to the ground should be encouraged. For this reason a somewhat wider parking space in street planting may be necessary than for some of the other fastigiate varieties.

—Courtesy Rochester Park Department
Pyramidal White Birch growing in Rochester, N. Y.

Pyramidal White Birch is a truly

(*Continued on page* 15)

Methods of Tree Injection

(*Continued from page* 7)

tive in killing trees. But the quantity of arsenic needed to kill the trees was far greater than if the poison was dissolved in water and injected directly into their transpiration stream (7).

There are several reports of the successful use of a dry iron salt for the cure of chlorosis induced by iron deficiency. Among the latest is that of Starr (18) of Wyoming, who placed from 5 to 25 grams of ferric phosphate per diameter inch in holes bored in cottonwood trees. After the chemical was inserted the holes were plugged. Early spring was the most satisfactory time for the treatment. Treatment during summer resulted in leaf fall, but the trees soon refoliated with leaves of normal green.

Driving metal into trunks is a method that can be classed as a dry injection technique. A disease of certain stone fruit trees known as "littleleaf", which is due to a deficiency of zinc, has been alleviated by driving zinc tacks 1 inch apart spirally around the trunks. Recovery of the trees was noted the year following treatment, according to a report of Chandler (3). Inserting crystals of zinc sulphate into holes bored in trunks was less successful.

A Dry and Wet Method

A unique method that combined the principles of dry and liquid injections was devised by Moreau and Vinet (13). They drew out, curved, and punctured the bottom of a glass test tube. The small curved tube was fitted tightly through a cork that was inserted into a hole bored into the main stem of a grapevine. The tube was then partly filled with sugar. Water that exuded into the tube from the stem dissolved the sugar, and the liquid was later sucked into the stem. The foregoing methods of injecting chemicals in the dry state are useful, but dissolving the materials in-water and injecting the solution into the tree results in more rapid distribution and is the only procedure that can be used in some cases.

Injection of Solutions from da Vinci to Hales

It has long been known that during the leafy season water moves rapidly from the roots to the leaves in great quantities. But even before this important fact was appreciated Roach (15) records that the genius Leonardo da Vinci (20) in the fifteenth century attempted to poison peaches by injecting arsenic into a hole bored into the trunk when the sap was rising. There is no record of casualties except perhaps the unfortunate tree itself. The next works of interest appeared almost 300 years later in the ingenious experiments of Magnol and Hales. From the time of these two inquisitive men in the early seventeen hundreds, numerous investigators have contributed to our knowledge of the movement of substances in solution in trees. The discoveries of these scientists, remote from any practical application as their technical experiments seemed when they were performed, have gradually led to modern injection methods. Indeed there is a striking similarity between some of the early attempts and some of the methods in use today. The chief distinction between the older and newer techniques is based upon a more complete understanding of the nature and causes of water movement in the wood. The English scientist Hales was one of the first to study these phenomena.

Hales (8) in 1731, in his desire to find out how water moves in trees and what forces bring about the movement, was probably the first to recognize and take advantage of the pulling or suction force of the leaves to introduce solutions into standing trees. He performed many injection experiments to determine how much force was exerted by the leaves. In a more practical vein he cut the distal end from an apple branch and fastened a container filled with a solution of "camphire" to the stub in an attempt to impart the odor to the fruit on other branches of the tree. He immersed leafy branches in solution and found that water was absorbed through the leaves. This method is still useful for some purposes, such as diagnosis of mineral deficiencies and supplying solutions to selected or restricted parts of trees.

Injection Methods for Solutions

There are many ways by which solutions can be injected. They may be introduced into holes bored into various

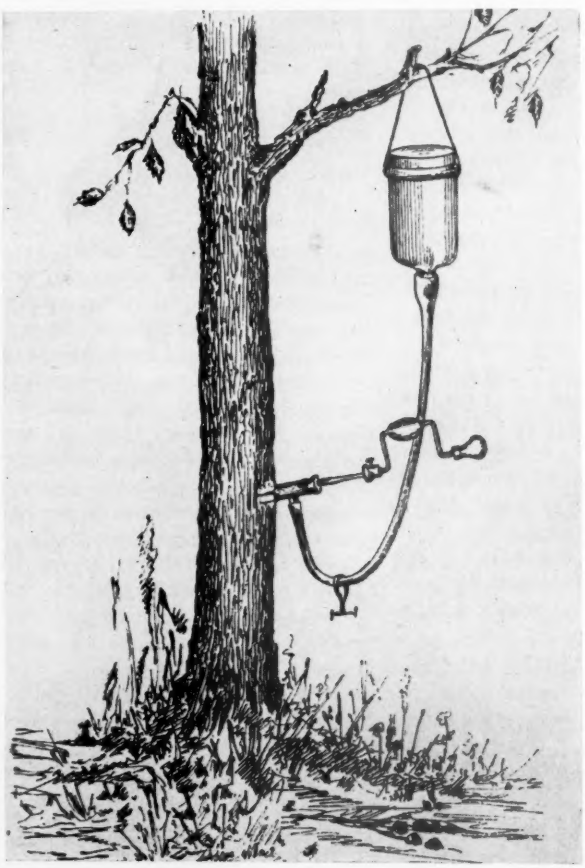

Fig. 4. In 1903 Mohrzecki published this diagram of a method of injecting trees. The bit turns in the tube previously sealed to the trunk; solution flows into the hole as it is bored and air is excluded during the operation.

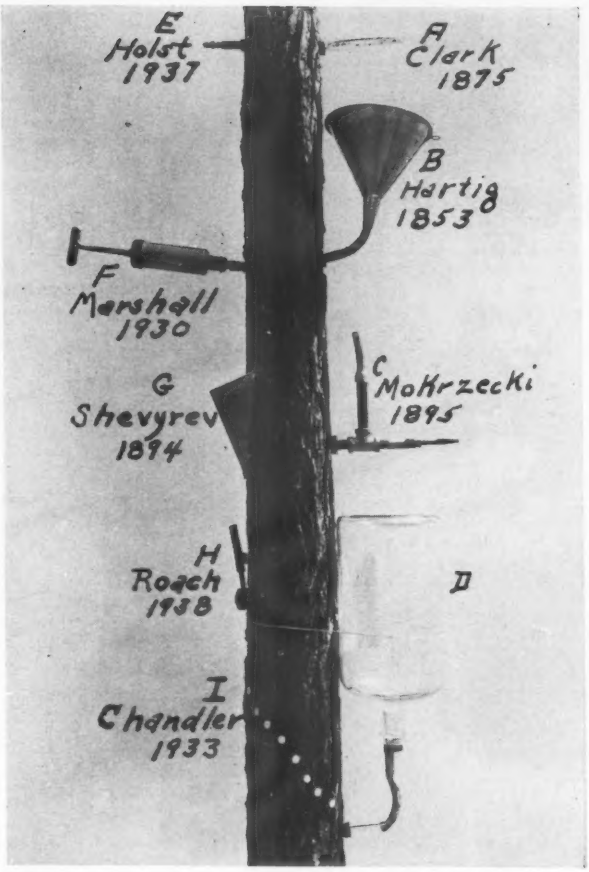

Fig. 2. Various types of injection apparatus with names and dates of originators. All except G and I are inserted in holes bored into the trunk. A. Glass tube inserted through cork. B. Funnel inserted through cork. C. Designed to permit boring hole under the solution so air is not admitted. D. Method representative of the type using an external reservoir to supply solution. E. Tire valve. The valve prevents loss of gases injected under pressure. F. Grease gun adapted to apply pressure. G. Pan sealed to part of the trunk. Cuts are made beneath the solution to prevent air entering. H. A long screw inserted through the hard rubber and into the bore hole and tree holds the rubber firmly to the trunk. Solution is admitted through the side delivery tube. I. Zinc nails driven spirally around the trunk.

parts of the tree; they may be drawn into the tree by inserting the cut end of roots in a reservoir, or by bending small branches, twigs, leaf stalks, leaf blades with their distal ends severed, or uncut leaves into the solution; or they may be admitted, through cuts directly into the water-conducting tissues, from reservoirs sealed around or to the various parts.

Bore-Hole Method

An external reservoir connected to a hole bored in the trunk is a method commonly used at present. The reservoir may be above or slightly below the injection hole, but less difficulty is encountered in obtaining a watertight connection between the tree and the injection apparatus if the reservoir is above the hole. Moreover, gravity assists in maintaining a continuous flow of solution from reservoir to tree. If a closed container such as a bottle is used, an air intake vent must be provided (Fig. 2, D).

Sealing the Feed Line

Various devices have been employed to insert the feed line into or hold it against the tree. Rubber stoppers, corks, and hollow tubes driven or screwed into a hole previously bored into the wood or held tightly against the trunk can be mentioned. These have been made watertight with various types of waxes, asphalt, and rubber cement, and by applying mechanical pressure. Rumbold (16) described a multiple hole injection method in which a link chain with a turn buckle inserted was placed around the trunk and over several rubber stoppers. By tightening the turn buckle, the stoppers were pressed against the trunk with sufficient pressure to prevent leakage. A glass T-tube, one arm of which was previously inserted into the stopper, provided, through its horizontal arm, a way to punch or drill the injection hole and, through its vertical arm, an inlet for solution. Roach (15) described a similar way to apply mechanical pressure to make a watertight seal. He ran a long wood screw through a hollow rubber stopper, provided with a metal side-inlet tube, into the hole in the tree (Fig. 2, H). The screw was made watertight at the head by means of a rubber gasket with a metal washer over it to give even pressure as the screw was tightened. Solution was admitted through the metal side-inlet tube. A short piece of metal tubing inserted into the end of the stopper that was pressed against the tree prevented the hole from closing when the screw was tightened. Both of these methods avoid closing the outermost water conducting tubes.

For best results the outermost rings should not be plugged any more than necessary by the sealing material because water movement proceeds most freely in many kinds of trees in the more recent annual rings. This is particularly true in trees with thin sapwood. Some investigators believe that the bore-hole method is not very suitable for such trees. However, the methods of Rumbold and Roach overcome this objection.

Practical Hints

The bore-hole method is simple but a few practical hints may be in order. If the holes are bored at a slight downward angle they can be filled with solution before the feed line is inserted. This precaution eliminates the possibility of an air block in the injection hole. Always bore with a sharp bit. Ragged surfaces resulting from dull bits frequently clog the conducting tubes. Before beginning the injection, the hole should be carefully cleaned of all fine particles of sawdust that might close the entrances to the water-conducting vessels. On some trees that can be injured easily it is worthwhile to remove a patch of bark slightly larger than the hole to be drilled to avoid bruising or springing the bark around the edge of the hole. Hollow punches of various sizes are convenient for this operation. After injection has been completed the hole may be plugged with a dowel of rot-resistant wood such as locust, or the entrance can be closed with stiff asphalt or grafting wax. On healthy trees, callus will grow over most holes in a year or two.

The bore-hole technique has certain practical advantages. It is a simple procedure, the apparatus can be attached and left for some time, the holes can be plugged after treatment and the tree will show practically no scars, and the whole tree can be treated with a sufficient number of holes properly placed. On the other hand, there is some mechanical

(*Continued on next page*)

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weakening due to the holes, and conceivably treatment year after year could cause considerable damage; the hole may become starting points for the development of rots. Some of these difficulties could be eliminated by boring no deeper than necessary, boring at different levels on the trunk, and exercising care to sterilize and seal the holes at the end of each treatment. Some of the apparatus that have been used in the bore-hole technique are illustrated in figure 2. Their installations can be understood easily from the illustrations.

In the illustrations of the various methods, dates have been placed beside the name of the man credited with first using each type of apparatus. These names and dates are the earliest the writer could find in the literature available. If earlier use of any of the apparatus comes to the attention of any reader, the writer would appreciate having it called to his attention so that corrections can be made in the future. Please cite names, dates, and places of publication as accurately as possible. If names and dates can be supplied for those methods illustrated from which these data have been omitted, that information will also be gladly received.

The apparatus illustrated in figure 2, D or some modification of it is probably the most commonly used. The container may be a bottle, wooden or metal bucket, rubber or canvas bag (Boucherie used a bag in 1840), or, in fact, any watertight receptacle. It may be hung from a limb, suspended from a nail, tied to the trunk as illustrated, or placed on a support. The essential requirements are to have the container level with or slightly above the point of injection and to have watertight connections. If a corked bottle is used, an air vent must be provided. The tube extending into the trunk should be of smaller diameter than the bored hole to permit easy access of fluid to the water-conducting tissue.

Description of Apparatus

Boucherie (2) was the first to use an external reservoir connected to a hole bored into the trunk. A hole 2 cm. in diameter was bored through the trunk of a large tree near its base. He then inserted a saw and carefully sawed away the interior, leaving, at two points, a thin rim of wood just capable of supporting the tree. He covered the cut with a tarred cloth wrapped tightly around the trunk. A tube that led to an external reservoir was sealed into one end of the bore hole. Solutions passed into the trunk and moved both upward and downward. No precautions were taken to exclude air during the installation of the apparatus. Thus Boucherie (2), over a hundred years ago, fathered one injection technique commonly used today. Boucherie was interested in devising a method of introducing preservative chemicals and was not concerned with the effects of the treatments on the trees.

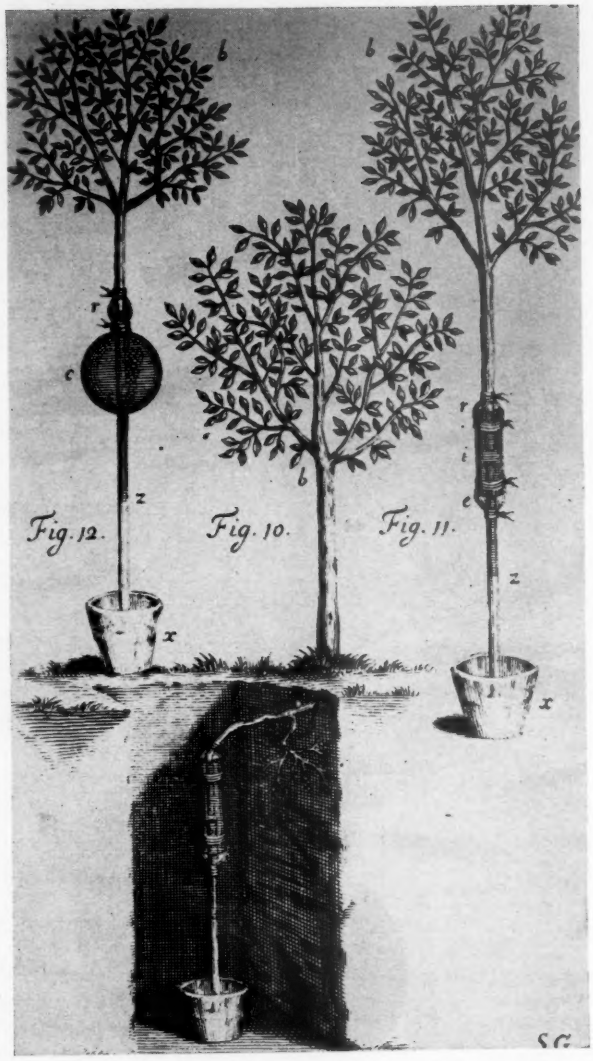

Fig. 1. Hales (1731) sealed a container to the root of a tree and measured the force with which water was drawn into the tree by immersing the lower end of a tube in a basin containing mercury. Photograph from Hales' original drawing published in his Statical Essays, Vol. 1.

Hartig (9) modified Boucherie's technique by sealing a funnel (Fig. 2 B) into the entrance of one hole that connected to a series of holes previously bored so as to meet in the center of the trunk. The entrances to all the holes except that containing the funnel were sealed. Solution was sucked out of the funnel and moved up and down the trunk, forming a pattern corresponding to the star-shaped alignment of the holes. Clark (4) seems to have been the first American to make use of an external reservoir sealed to holes in tree trunks. He used a ½-inch glass tube 6 ft. long and observed the intake of water by an elm in June 1874 (Fig. 2, A).

Apparatus for Injection Under Solutions

The notion persists that it is necessary to make injections without permitting air to enter the tissues. This precaution is not necessary but may be advantageous under some conditions or on some species. However, injections can be accomplished

(*Continued on page* 14)

The Man In the Field

(*Continued from page* 6)

and more or less unnatural appearance when viewed in a leafless state, due to the large number of damaged limbs that it was necessary to remove in repairing as much as possible the storm damage.

At the time this work was done, the pruning wounds, which ranged in size all the way from a dime up to a huge cut of one or two feet in diameter, were coated with tree paint and the home owner in most cases felt that he had done his part and dismissed the matter from his mind, leaving it up to mother nature to do the rest and mother nature has done her part.

It's safe to say that in nearly every case there is a good healing around these wounds and most of the smaller ones are already completely healed, eliminating all danger of decay at that particular point. But what about the larger wounds? Some of which will require from ten to twenty years to heal completely over.

Let us consider for a moment the man who builds a new house. Is he satisfied that a single coat of paint will protect his house from becoming weather beaten

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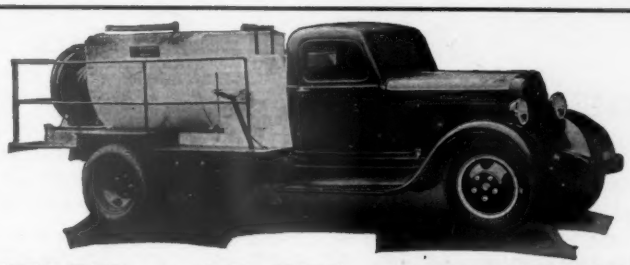

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TREE INJECTION

(*Continued from page* 12)

in both winter and summer without the necessity of taking this precaution or of using a complicated apparatus such as that of Shevyrev or Mokrzecki (Fig. 2, C and Fig 4). It is true that during the growing season the flow of solution sometimes begins more quickly if cuts are made under water. But, without taking this precaution, the time required to install necessary apparatus and begin an injection usually is not so long that the success of the injection is jeopardized. For experimental purposes, where exact measurements of the extent and rate of flow or other similar information is required, injection under water is sometimes desirable.

Pan Technique

For injection under water, the pan procedure of Shevyrev (17) (Fig. 3, B) has been used at the Field Laboratory of the Division of Forest Pathology at Morristown, N. J. in the investigation of the destructive Dutch elm disease. The pan is placed around the trunk and one end nailed to the trunk at the bottom edge. The pan is then tightened and the free end, which laps over the end previously secured, is nailed in place. Nails, driven to about half their length and bent over to make removal easy, are driven through all the remaining lugs which are spaced at regular intervals on the bottom edge of the pan. It is important to have the pan fastened securely so that the weight of the solution will not spring the sealing material and cause leaks. A "C" clamp is used to hold the overlapped edges of the top of the pan in place. A strip of adhesive tape is placed over the entire length of the overlapped edges to seal them. The crack between the pan and trunk is filled with a watertight sealing material. Plastic clay is convenient for this purpose. The plastic clay must be tamped firmly so all the small cracks are filled and a tight seal made. Water is used to test the seal. If there are leaks, they can be fixed before the pan is filled with chemical. It is difficult to seal the pan to the trunk of rough barked trees. In such cases some smoothing of the outer bark is necessary. This partial decortication leaves an unsightly scar for a short time. When all is ready the solution to be injected is poured into the pan. Chisel or gouge cuts ⅛ to ½ inch wide are then made under the solution and as close to its bottom as possible. One-eighth to ½-inch chisel cuts, alternating with uncut sections of the same width, have been made entirely around trunks of trees without unduly severe aftereffects in the cases of elm, maple, and horse chestnut. This procedure ensures maximum distribution of the solution in the outer shell of the trunk and throughout the top. The cuts are made into the more recent annual rings only. These cuts generally heal in one to two growing seasons, no weak spots are left, the tree can be treated many times.

Small containers (Fig. 2, G) covering only a small sector of the trunk have been used by Shevyrev and others.

Instead of a metal pan, various other types of watertight materials have been used, such as inner tubes cut and stretched around the trunk, and rubberized fabric or waterproof crepe paper as used by Lantz (10) (Fig. 3, A). Containers of the latter type can be tacked around the tree and sealed at their bases with asphalt paint. The overlap is sealed with asphalt and tacked to the trunk. The top is tacked at three or four points. Lantz gives the capacity of various sizes of containers of this type.

For winter injections, where freezing and thawing are a problem the metal pans are not satisfactory because it is too difficult to keep them watertight. But rubber or rubberized fabric containers are satisfactory.

Wick Technique

An interesting method of injecting parts of leaves was devised by Roach (15). He cut a slit in the blade of the leaf, inserted and then sealed a wick into the slit. The free end of the wick was then inserted into a container fastened securely nearby. Roach also reported that leaves with their tips or with any fraction or all of the blades cut off were immersed in various test solutions. Diagnosis of mineral deficiencies was made in a few days by the reactions of the leaves. Thus, in a case of chlorosis, one could determine by treatment of a few leaves if the trouble were due to lack of available iron.

Root Injections

Root injections have been used for more than 200 years. Hales (8) in 1731 dug a hole deep enough to permit him to place a container below an exposed root (Fig. 1, f. 10), cut the root, sealed a vessel containing water to the root's end, connected the vessel to a dish of mercury, and measured by the height of the mercury column the force with which a pear tree sucked up the water. In 1897, Goff (6) attached a long rubber hose to the cut end of a root of a dormant recently transplanted tree. The other end of the hose was sealed to a reservoir elevated above the top of the young tree. Thus pressure was obtained on the highest buds. He states that a purple beech which previously had shown no signs of developing began to expand buds six days after a treatment which began on May 29. Several other investigators, including Krauss, Tschermak, Schmidt, Berlese, and Gaunersdorfer, have successfully injected chemical directly through the roots.

Trees that have lost a part of their root system might be temporarily carried over dry periods by utilizing a modification of Goff's method. The end of a root could be attached directly to a water line fitted with a valve to regulate the amount of water supplied. This suggestion is offered as a possibility only. It has not been tried by the writer.

Pressure Injections

There remains to be considered only the use of pressure to force substances into trees. Pressure has been used in attempts to inject greater quantities of materials within a given time and to get distribution, which might be of value in the treatment of such troubles as slime flux, into otherwise inaccessible parts of the trunk. Roach (15) reports that Anderssen found, if 5 pounds pressure was used to start injection in citrus, the intake of solution proceeded satisfactorily thereafter without pressure in trees that previously could not be injected. In practice it has been found that too much pressure splits the bark from the wood and sometimes splits the wood itself. However, Roach used up to 40 pounds per square inch without injury to apple. He states that raising the container 19 to 94 inches above the injection hole did not materially alter the rate of intake of his solutions. Holst and May (10) in 1937 used as much as 25 pounds per square inch direct pressure to inject gases such as hydrogen cyanide and sulphur dioxide into elms in some of their studies on the Dutch elm disease.

The appartus and procedure used in pressure injections have usually been

(*Continued on page* 16)

The Man In the Field

(*Continued from page* 13)

and starting to decay? Certainly not. He applies two and sometimes three coats of paint to obtain the necessary protection. Nor is he satisfied with this alone, but is careful to have his house repainted every few years to maintain this protective coating effective at all times.

This same principal applies to protecting large pruning wounds until such a time as the healing completely closes over and seals them. After which time no further repainting is necessary. However, until this complete healing has taken place, there is a constant danger that the tree owner will neglect this extremely important task.

Each pruning wound if neglected is a potential cavity, since the wound on which the paint has been allowed to weather thin, like the unpainted wound, will check open and allow wind and rain to carry fungus spores into these cracks, where they will germinate and start decay that can only be eliminated by cavity work.

So it is plain to see that the single coat of paint applied by your arborist nearly four years ago has been inadequate to protect the wounds over such a long period of time without a second or third coat being added and it is needless to say that if the repainting is delayed until the surface of the pruning wounds have become infected with decay, repainting will be useless as the decay will continue to eat right on into the tree underneath the paint. Therefore everyone who values their trees would do well to check up on this matter before it is too late.

* * *

The article was well received and so I ventured to write another and have kept it going since that time with a new article appearing each Sunday in the newspapers of the three large cities which comprise the bulk of my territory.

The results have been extremely gratifying and I have received *hundreds of dollars worth* of *free indirect advertising*, which in my opinion is *considerably more effective than the direct sort.* There is however, a good deal of headache attached to the editing of a tree column. This matter not only cuts into ones recreation time seriously, but it becomes increasingly difficult to think of a new subject to write about both of which combine to make the writing business increasingly distasteful.

I have a scrap book filled with these articles and the thought came to me that a letter appearing in TREES would perhaps uncover others in the profession who have a similar column and who like myself are growing weary of article writing and would like to *exchange a few of their articles for some of the other fellows.* In any event, the tree column idea is thought provoking and could easily do a world of good, especially where the newer men who are starting in business for themselves are concerned.

Editors Note—Here is a splendid opportunity for Arborists throughout the country to get together on a good business producing publicity plan. We hope they are on their toes and take advantage of this opening.

Indian Oak 500 Years Old

HARRISBURG, Pa.—The "sacred oak of the Delaware Indians" is the grandfather of Pennsylvania's forests. Located in the Oley Valley, the Indian tree, a chestnut oak, is 500 years old.

Upright Trees

(*Continued from page* 9)

graceful tree. It should prove of value for planting on narrow streets, in confined areas, formal locations, and as a specimen tree. It is ideally formed for use in windbreak and screen planting, and would be a welcome relief from the common, less beautiful Lombardy Poplar.

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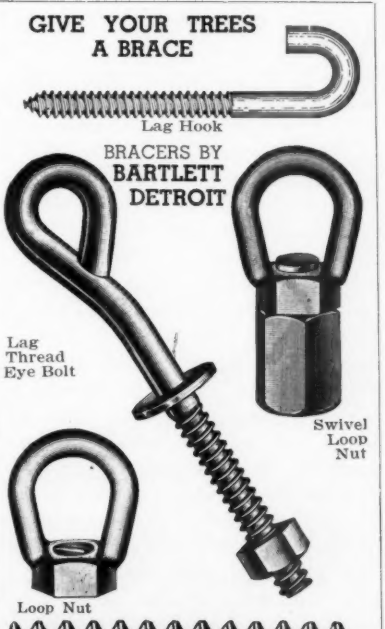

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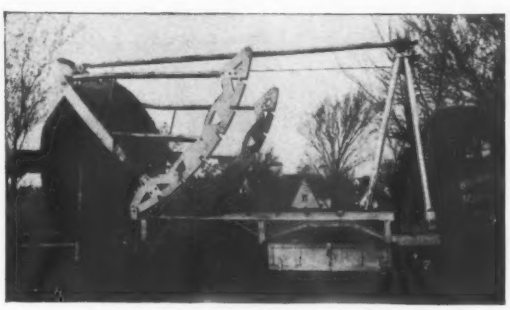

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Tree Injection Methods

(*Continued from page* 14)

simple. Marshall (12) applied direct mechanical force by adapting a grease gun (Fig. 2, F) to force solution into bore holes. Compressed air sprayers, a modified blow torch, and even a bicycle pump have been used for the same purpose.

Holst and May (10) used a valve from an automobile inner tube (Fig. 2, E). The valve was removed from the tube, the protective flange taken off, and the inner end of the valve casing tapered. The tapered end was fitted securely into the hole bored in the tree. A valve such as is commonly used to inflate automobile tires was fitted to a pressure hose leading from a tank of compressed gas. By a suitable system of reducing valves, any desired pressure was obtained. The tire valve prevented escape of the gas when the desired quantity had been injected. It is interesting to note that gas escaped during the period of injection through scars where branches had fallen off or through other injuries into the wood many feet from the injection hole. Gauges inserted into the trunk indicated a reduction in pressure as the distance from the point of injection increased. Effects of some gases were noted in the leaves within 72 hours after injection.

This brief review probably has omitted some of the methods and apparatus used in tree injections. The writer would be glad to have such omissions brought to his attention. Certainly the possibilities of devising new methods have not been exhausted. With increased knowledge of the basic physiology underlying the movement of substances in trees, undoubtedly better methods of injection will be devised. There is one noticeable omission. No methods of injecting substances directly into the bark have been described. Such a technique would have important possibilities and should be investigated. This fascinating field of research on tree injections for various purposes is in its infancy, needing only to be cultivated more thoroughly and thoughtfully to produce new and practical results.

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City Arborists' Column

(*Continued from page* 8)

There are many more City Arborists from whom we hope to hear.

* * *

Here's one that Howard Muellner, City Forest of Wauwatosa, Wis., would like a lift on—"another problems we have is the attack on elm trees by a bark rot. The outer bark scales off and the inner bark, which has become a brick red color, dusts off due to its impregnation by the fungus disease. This usually occurs at the base or on the trunk of any aged American elm. We have tried to overcome this fungus attack by using carbolineum as a fungicide, but with only fair results. This treatment stops the rot and injures the cambium too, which isn't so bad, only that the fungus reappears in another spot somewhere above the original injury in the next season."

If anyone recognizes this trouble and has a control, pass it on.

Image of Woman Outlined By Tree

MADISONVILLE, Ky.—Nature and legend have built this monument to Mandy Holloman, a Negro woman, dead 24 years.

The white oak stands just outside Madisonville, where, if you believe in ghost stories, a "ha'nt" keeps silent vigil. The foliage forms a perfect image of Mandy's head.

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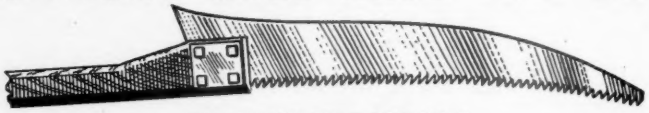

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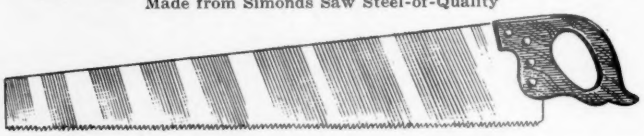

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THRU *the* MICROSCOPE

By C. J. HUMPHREY

TREE AND SHRUB FERTILIZATION: An excellent presentation of the subject is given by Chadwick (1). Methods and time of application and kind and rate of application of fertilizer are discussed. The paper closes with dosage recommendations for narrowleaf evergreens, broadleaf evergreens, deciduous shrubs, and roses.

DISEASES OF FLOWERS AND ORNAMENTALS: A well-illustrated pamphlet of 108 pages by Ralph E. Smith (2) briefly discusses the various diseases of flowers and ornamentals which have come to the attention of the author during his long period of service at the California Agricultural Experiment Station at Berkeley. Many trees and shrubs are mentioned and control measures are indicated where known. The circular is free.

Pirone (3) also put out a well-prepared and profusely illustrated pamphlet from the New Jersey Experiment Station, New Brunswick, which discusses mainly diseases of annual and perennial flowers. It includes, however, a number of shrubs, but no trees. It is priced at 50 cents by the station. I suggest that those interested write Dr. P. P. Pirone.

ARMILLARIA MELLEA: Bliss (4) adds to our further knowledge of this fungus. He states that *detached* rhizomorphs were not infective, but infection readily took place by the use of infected wood, or rhizomorphs attached to wood. Infection occurred in highly acid soils as well as alkaline. The California pepper tree (*Schinus molle*) became infected after 71 days, in relatively moist soil at 68 degrees F. A soil fungus, *Trichoderma lignorum*, suppressed the fungus in agar culture but did not destroy it in wood after a pseudosclerotium had formed.

Benton and Ehrlich (5) discuss physiological variation in a number of cultures taken from infected roots of *Pinus monticola*. Among these there is wide variation in appearance, rhizomorph production, rate of growth, and temperature and moisture reaction. The following optimal conditions for growth are given: Moisture content of wood, 150 per cent; temperature 71 to 77 degrees F., with some of the more vigorous cultures showing slight growth at 91 degrees F.

TEXAS ROOT ROT: Streets and Brinkerhoff (6) of the Arizona Experiment Station summarize the results of three years' treatment of pecan groves for the control of the *Phymatotrichum* rot—pecan trees being very susceptible to this disease. During the period, data were secured on the number of new infections and the number of pecan trees killed each year under five different conditions of intercropping and soil treatment. Of 6800 trees, 24 per cent became infected, but where these were promptly treated only about 1.5 per cent died. Most of the treatments were combinations of ammonium sulphate, or ammonium phosphat, and sulphur, with a basic application of 1 pound of each to 100 square feet of area, extending to the drip of the branches. This was followed by a 4-inch irrigation. In comparison, an untreated, severely infected 10-acre grove interplanted with alfalfa (a highly susceptible crop) showed 71 per cent of the trees diseased.

According to Blank and Talley (7) ammonium salts are not toxic to *Phymatotrichum*. They tested both the sulphate and phosphate, with and without calcium carbonate. Those fertilizers induce an acid condition which is unfavorable to the fungus, but the beneficial results of treatment are thought to be mainly the result of an improved growth response. This in itself, however, is no assurance of permanent control of the disease.

DAMPING-OFF: Investigations in the Great Plains region on the effect of rotation and previous crops on the control of damping-off of broadleaf seedlings, caused mainly by *Rhizoctonia* and *Pythium*, were carried out by Wright (8). Damping-off was usually more severe following legumes, much less so after corn, wheat, and oats, the trend increasing directly with increased nitrate content of the soil. Application of sugar to the soil, probably by its action in accelerating the growth of soil organisms which consume or bind the nitrates, lowers the virulence of the damping-off fungi and reduces losses.

DUTCH ELM DISEASE: In the 1940 report of the Cornell Agricultural Experiment Station Welch *et al* (9) point to the danger of *dead* wood from healthy elm trees becoming infected from beetle-carried spores. After developing therein the young beetles, in turn, become heavily infested with spores. Spread of the fungus from place to place may therefore occur without the presence of diseased trees in the locality. Collins *et al* (10) continued a study of the control of insect vectors. Spraying with lead arsenate and sulphur reduced the number of infections transmitted to small trees. Logs were best protected by treating them with a mixture of creosote, paradichlorobenzene, and paraffin in kerosene. The addition of pyridine increase the capacity to kill insects already in the bark.

Parker *et al* (11) carried on further infection studies. Beetles with numerous surface spores were allowed to feed on healthy elms. Infection was easily obtained following late spring or early summer trials, but later ones induced infection less frequently, or not at all. If spores introduced into feeding scars by the beetles did not invade adjacent tissues within a few weeks infection never resulted, although the fungus might remain viable in the scar for three years. Hence a great number of inoculations made by beetles do not produce true infection.

By artificial inoculation tests on ten different species or varieties of elm Smucker (12) compared their relative susceptibility to the disease. Trees ⅜ to 1¼ inches in diameter at the base were inoculated in early June, 1940. The American elm proved most susceptible. The *Ulmus pumila* group showed considerable resistance and, in general, escaped serious injury. The Christine Buisman selection from *U. foliacea* showed negligible die-back, although there was a fairly extensive invasion by the fungus.

True (13) reports the interception of the fungus in elm wood used in dish crates imported from England in August, 1940.

An anonymous note in Florists Exchange and Horticultural Trade World (14) claims the development of a method of chemically treating infected elms, with rubber playing a vital part in the technic.

The U. S. Burea of Entomology and Plant Quarantine (15) presents a map showing the distribution of the disease as of September, 1941. There has been a gradual extension around the main infection area centering around New York City; first report from western Massachusetts; active distant centers around Athens, Ga. and Indianapolis. Federal quarantine 71 was revised, effective October 1, 1941 (16). Elm lumber, if entirely free from bark, is exempted.

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Among the many peculiar customs and rules governing marriage in India is that a Hindu cannot wed for the third time. If he wishes to take a third wife, he first marries a babul tree, or an oak. Thus the woman of his choice becomes his fourth wife.

A similar union is performed when a rich Hindu has no son for an unusually long time, or no child at all. He has a Brahmin married to a sulsi plant (which is believed to be a nymph turned into a plant by Lord Krishna, the Hindu God). This he does at some expense, going through all the ceremonies from beginning to end. The plant is then formally made over to the Brahmin with bridal procession and pomp, and for the rest of his life the pseudo-father of the plant treats him as his son-in-law.—*Hollis Howe.*

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Authors and Books

The following books may be ordered from TREES Magazine, Box 886, Santa Monica, California.

SCIENCE IN THE GARDEN, H. Britton-Logan and Jean-Marie Putnam. Duell, Sloan & Pearce, Inc., 270 Madison Ave., New York. 255 pp., $2.50.

This is a very interesting book written primarily for the layman, but it would be well for many a busy professional Arborist, Nurseryman or Park Man to read it and learn of many of the latest developments science has made for the advancement of horticulture.

It discusses in non-technical language such subjects as: Colchicine and Acenapthene; Chemical analysis of soil; Parthenocarpy; Vitamin B1; Chemical acceleration of seed germination; Evolution of New Plants, etc.

A very worth while book for anyone.

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COMMERCIAL FERTILIZERS (Third Edition) Gilbert H. Collings. The Blakiston Co., Philadelphia, Pa., 480 pp., illus. $4.50.

The value of fertilizing and fertilizers is becoming more important each day in the field of tree preservation and a knowledge of what fertilizers are, how they are made and how they work is invaluable to people in Arboriculture, as well as Park departments and Nurseries.

This book is an exhaustive study of the situation, and while the discussions on use are based on farm crops, still the general information on reactions and needs in certain deficiencies is comparable for tree and shrub application.

Study of this book will give one a fine knowledge and understanding of the subject.

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FORESTRY IN FARM MANAGEMENT, R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc., New York. 339 p., illus. $3.00.

Entirely too little has been done in regard to a real farm forestry program in America. Intelligent management of farms has not been the general rule and the result is well known to all—floods—dust bowls and foreclosures. This fine book analyzes the subject thoroughly, and should be recommended to all progressive farmers and woodland owners.

Many foresters too, have been lax in recognizing the full value of this phase of forestry; to them this book will be a liberal education.

The information contained in appendix B on the "Habits and Requirements of Important Tree Species" is worth the price of the book alone. Approximately 80 species are discussed with regard to: Soil requirements; Competitive ability; Natural regeneration; Wind firmness; Insect and Disease susceptibility.

* * *

CORK AND THE AMERICAN CORK INDUSTRY, Arthur F. Faubel. Cork Institute of America, 25 W. 43rd St., New York. 151 pp., illus. $1.50.

Not many people know that cork is the bark of a tree—an oak, Quercus suber—also, the many hundreds of uses of cork. The book discusses very interestingly the manufacture and uses; production and marketing and lastly, the possibilities of a cork industry in America. The cork oak does well in California, also from South Carolina to the Gulf.

SOUTHERN SHADE TREE CONFERENCE, PROCEEDINGS, FIRST, SECOND, THIRD AND FOURTH MEETINGS. Edited by H. S. Newins. University of Florida, Gainesville, Fla. 220 pp. mimeo. $2.00.

The long-awaited Proceedings are with us and well worth the wait. The papers cover many and diverse subjects and by no means are confined to Southern problems, e.g., "Callous Formation of Tree Wounds and Their Treatment," H. C. Scott; "Scientific Aspects of Handling Tree Cavities," Rush P. Marshall, are several of the valuable papers.

Your purchase of this Proceeding will give you some very worthwhile reading.

* * *

SUBDIVISION REGULATIONS, Harold W. Lautner. Public Administration Service, 1313 E. 60th St., Chicago, Ill. 346 pp., $3.75.

It would seem that the all-important subject of street trees in new subdivisions has still not been given the place of prominence that it should occupy. This book devotes four pages to the subject comprising for the most part excerpts from ordinances.

The remainder is a review of regulations and ordinances pertaining to all phases of subdivision planning.

* * *

THE ADVANCE OF THE FUNGI, E. C. Large. Henry Holt and Company, 257 Fourth Ave., New York. 486 pp. illus. $4.00.

The man who wishes to remain well-informed will secure from this scientific novel a world of information as well as hours of pleasurable reading. The author is an English specialist in insecticides and fungicides. He writes authoritatively; in addition is witty and penetrating. One of the most worthwhile books in a long time.

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THE DISEASES OF THE COCONUT PALM, H. R. Briton-Jones. Williams & Wilkins Co., Baltimore, Md. 176 pp. illus. $3.50.

A very comprehensive treatise of the diseases of this commercially important tree. Might be of value for diagnosis of ornamental palm disorders in Florida.

* * *

PRUNING FRUIT TREES, Warren P. Tufts. Agricultural Extension Service, Circular 112, University of California, Berkeley, Calif.

* * *

THE PROPAGATION OF SOME TREES AND SHRUBS BY CUTTINGS, William L. Doran. Bulletin No. 382. Massachusetts Agricultural Experiment Station, Massachusetts State College, Amherst, Mass.

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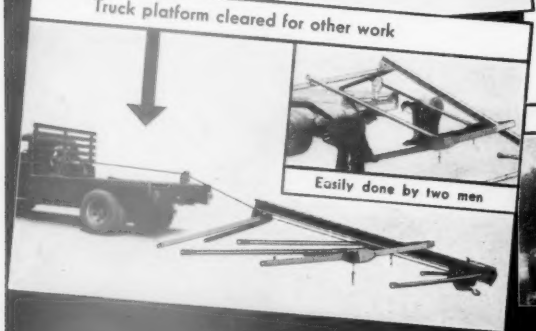

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GAR WOOD INDUSTRIES, Inc.

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